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Grimm et al.

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(54) **ROTATABLE BUCKLE ASSEMBLY**

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A44B 11/25	(2006.01)

(52) **U.S. Cl.**
CPC ***A44B 11/25*** (2013.01); ***A44B 11/2592*** (2013.01); *Y10T 24/45241* (2015.01); *Y10T 24/45623* (2015.01); *Y10T 24/45675* (2015.01)

(58) **Field of Classification Search**
CPC . A44B 11/25; A44B 11/2592; A44B 11/2534; Y10T 24/45241; Y10T 24/45623; Y10T 24/45675; Y10T 24/45524; Y10T 24/45529; Y10T 24/45581
See application file for complete search history.

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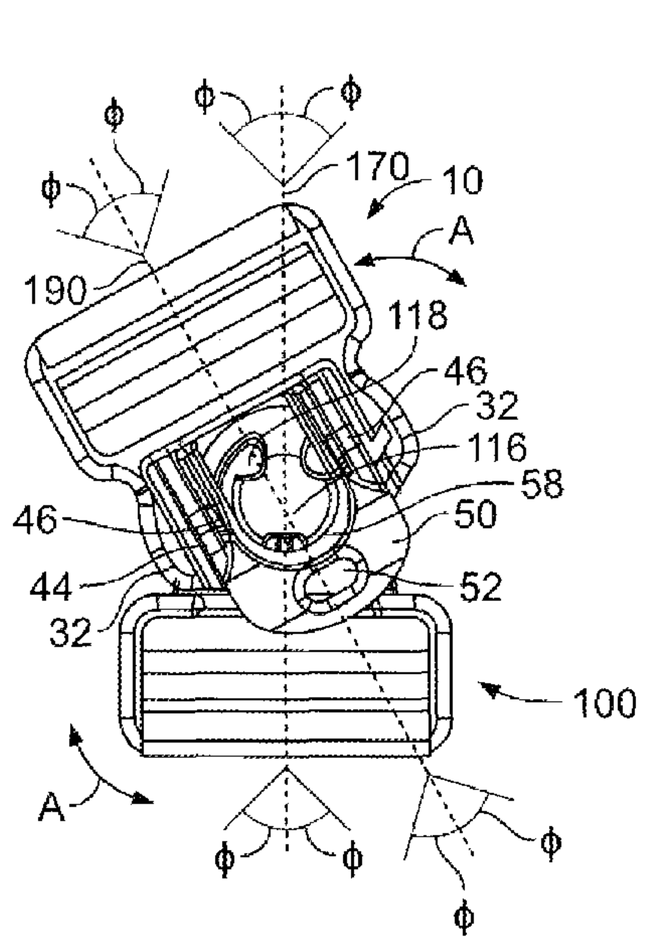
(57) **ABSTRACT**

A rotatable buckle assembly may include a male buckle member, and a female buckle member configured to rotatably connect to the male buckle member. The female buckle member may include a handle that is configured to be pulled to disconnect the first buckle member from the second buckle member.

20 Claims, 5 Drawing Sheets



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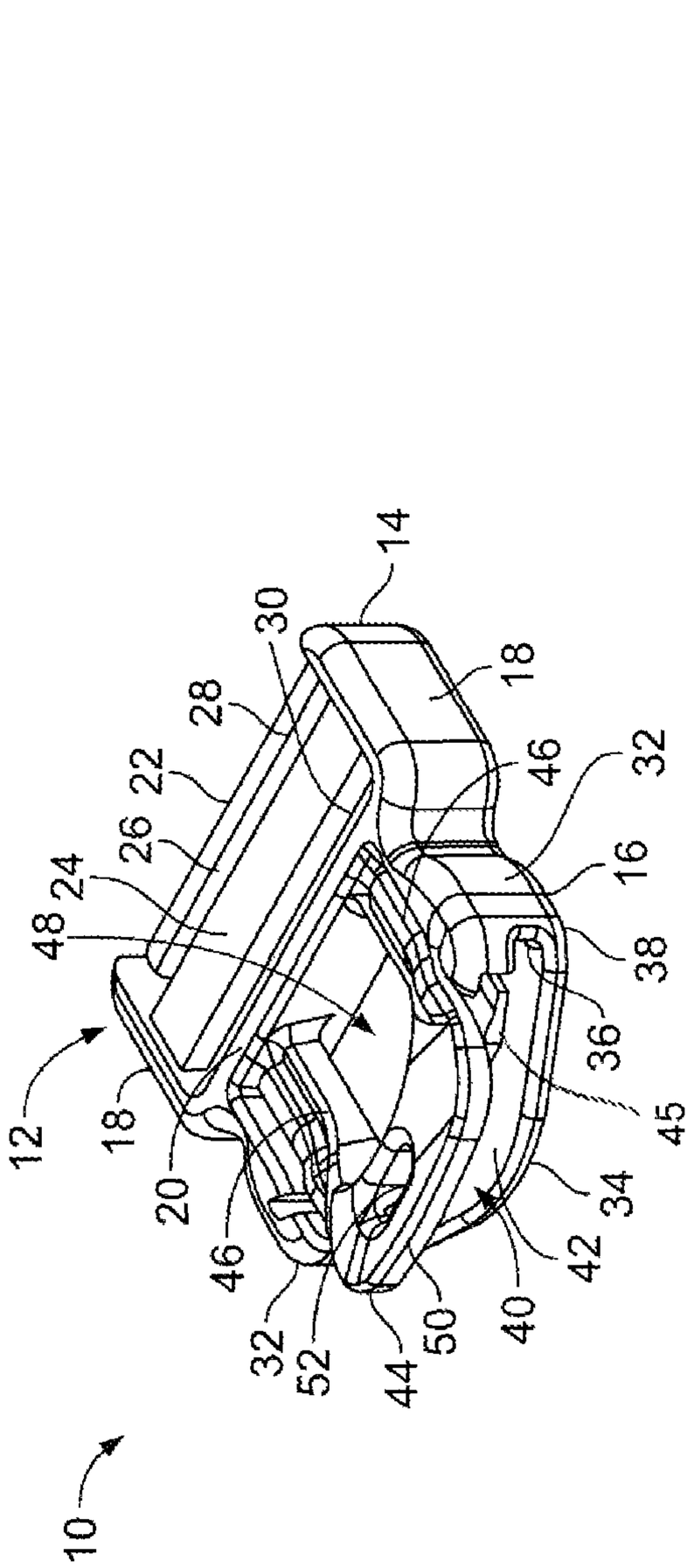

FIG. 1

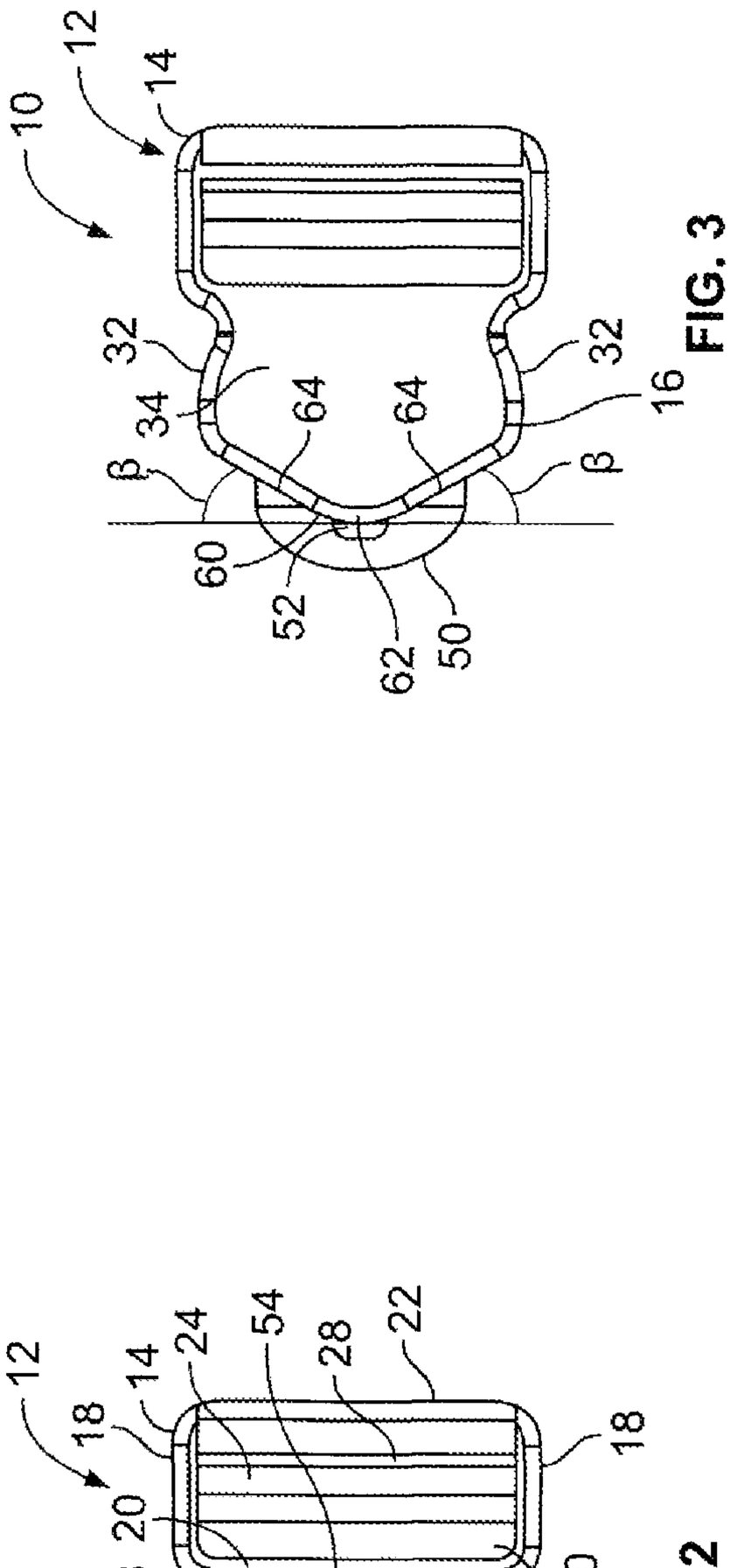

FIG. 3

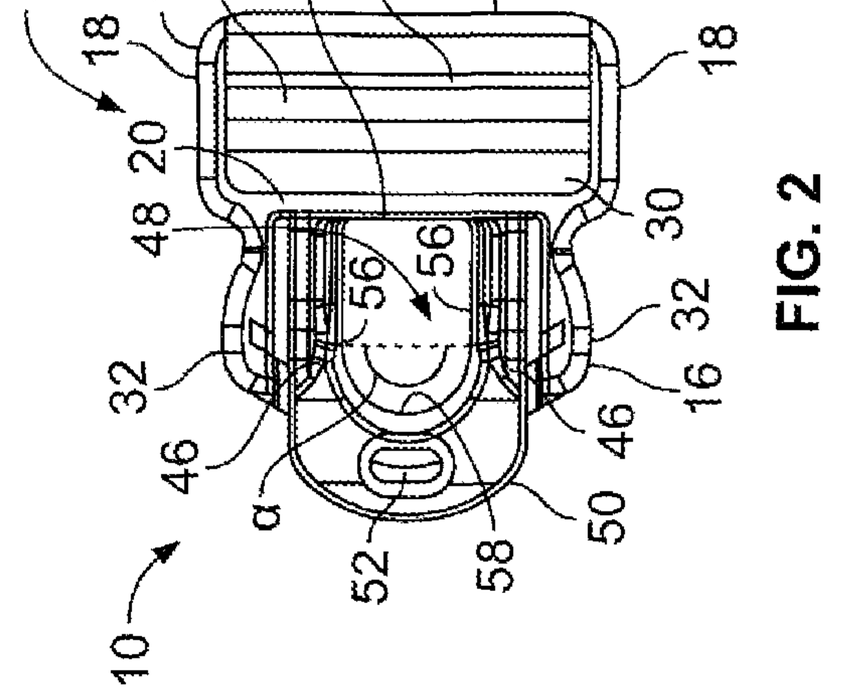

FIG. 2

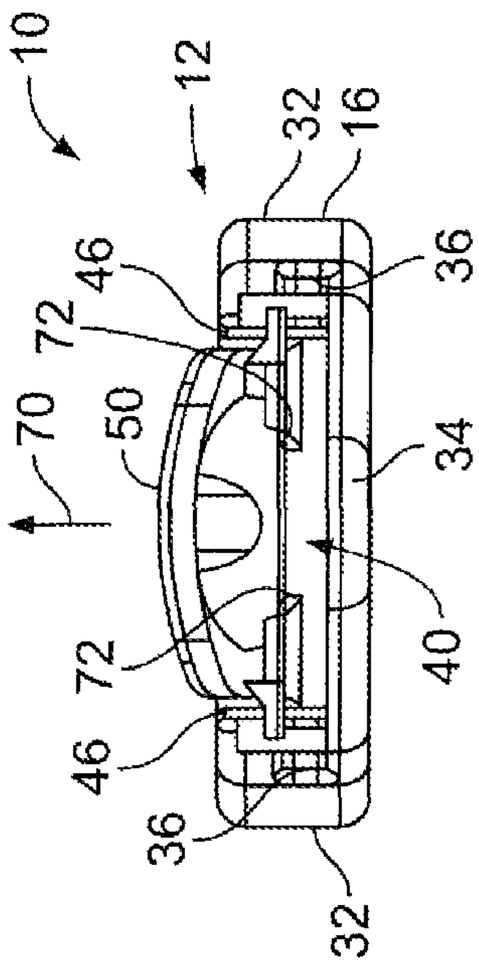

FIG. 5

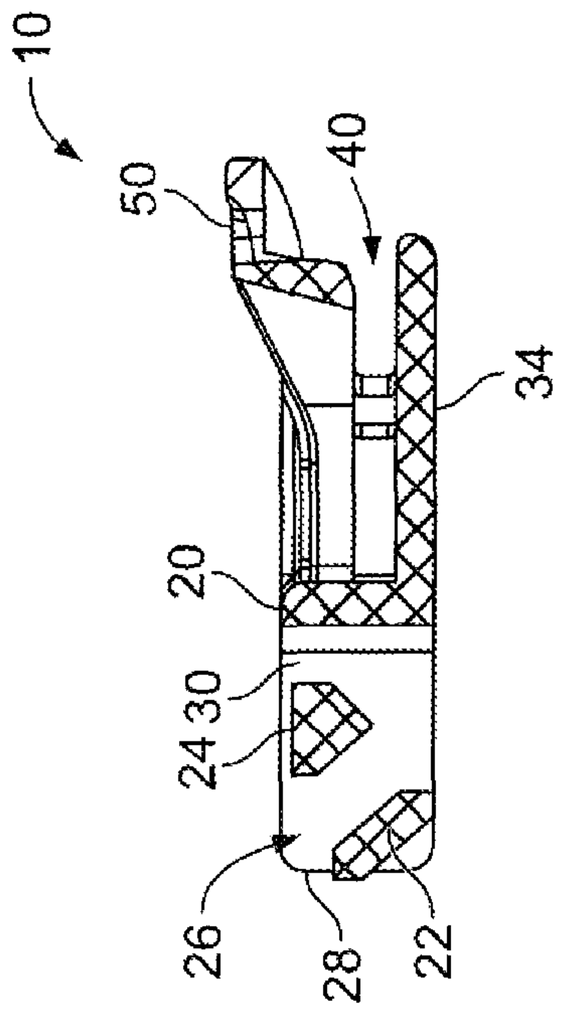

FIG. 7

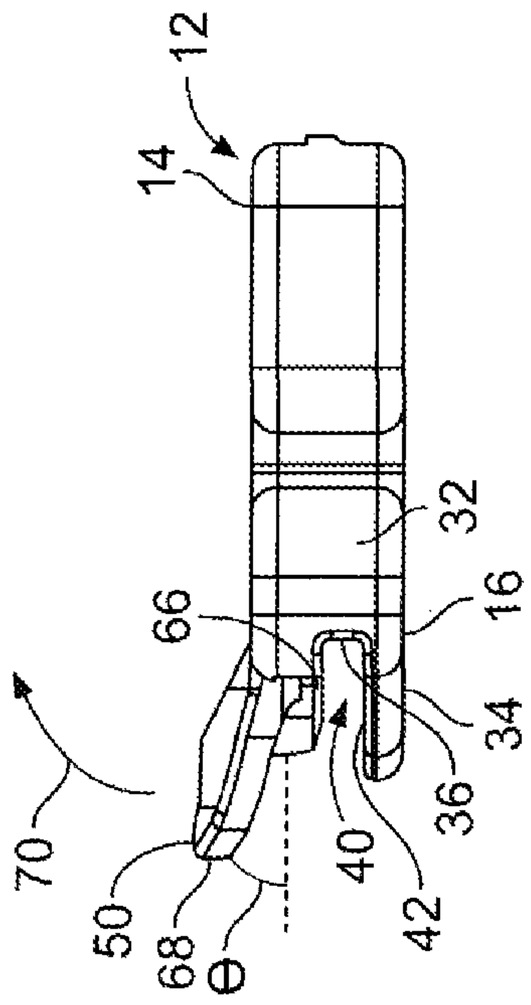

FIG. 4

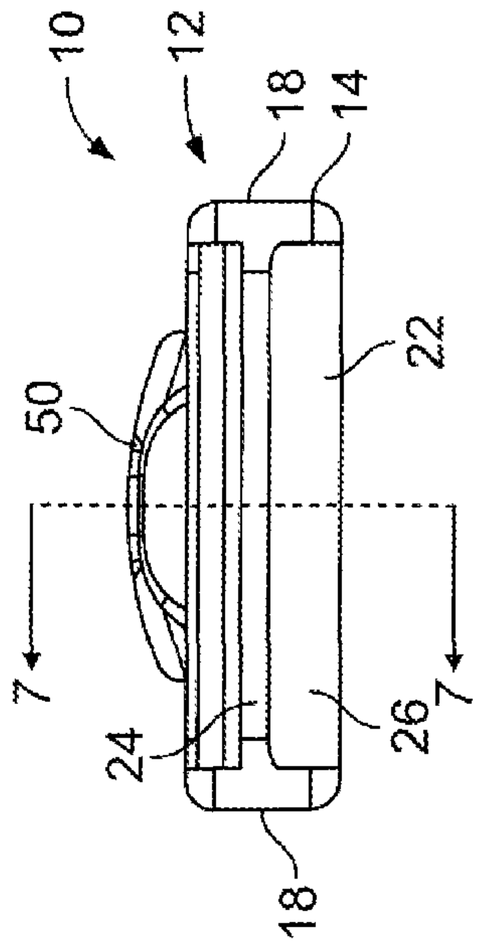

FIG. 6

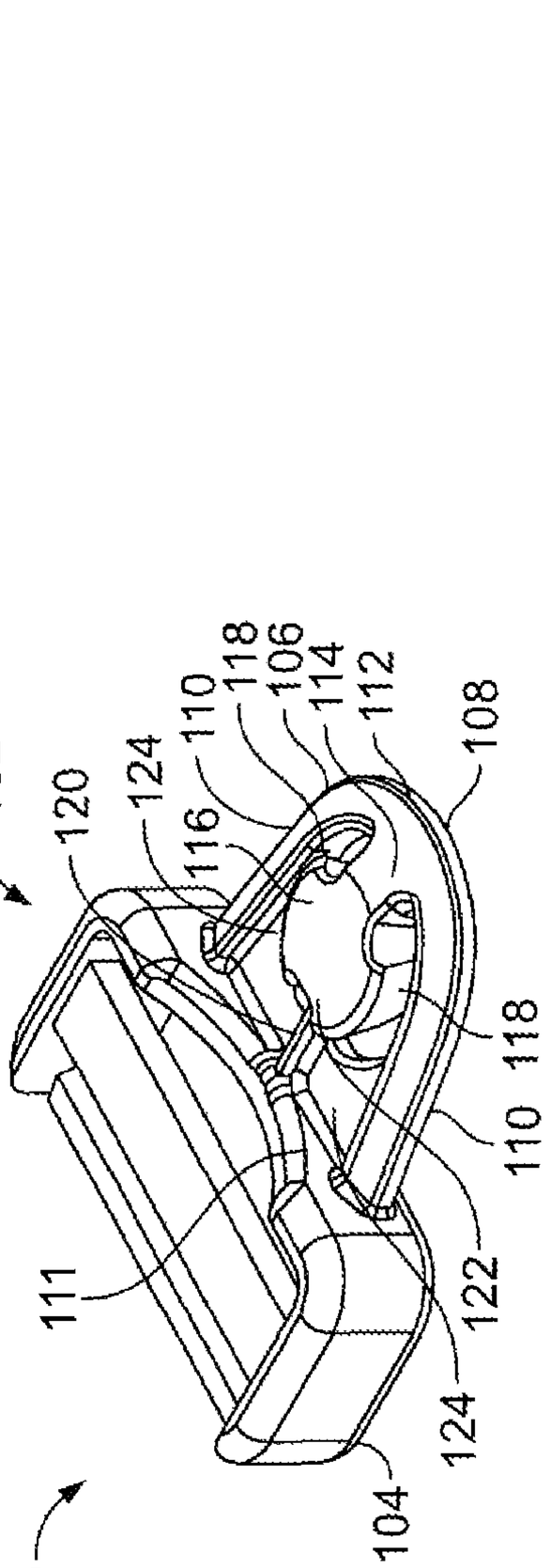

FIG. 8

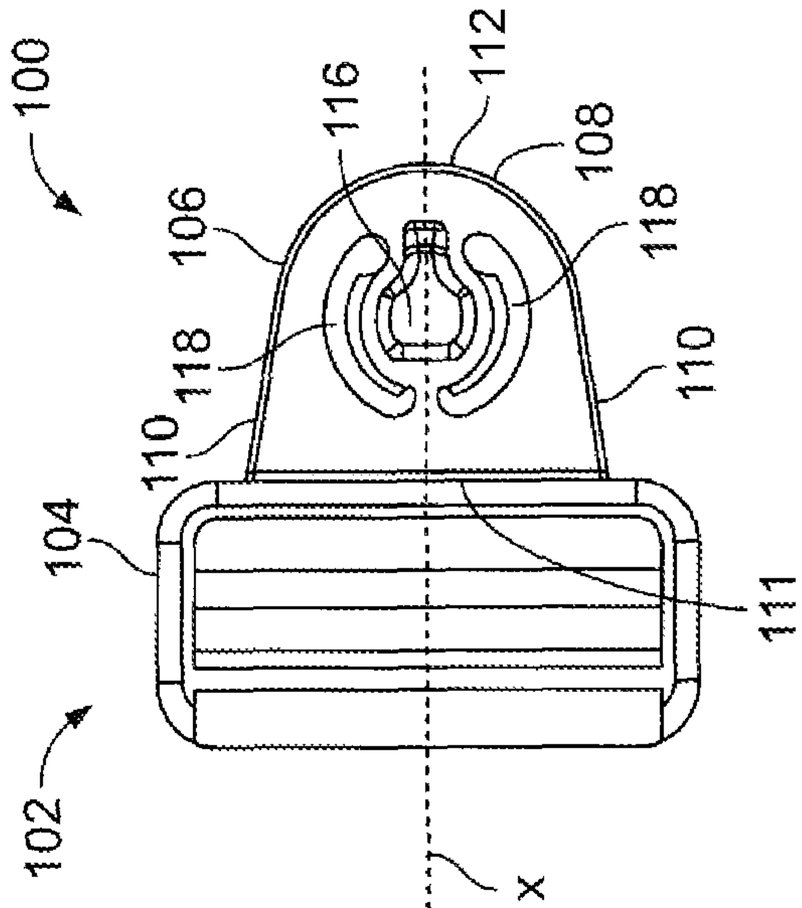

FIG. 10

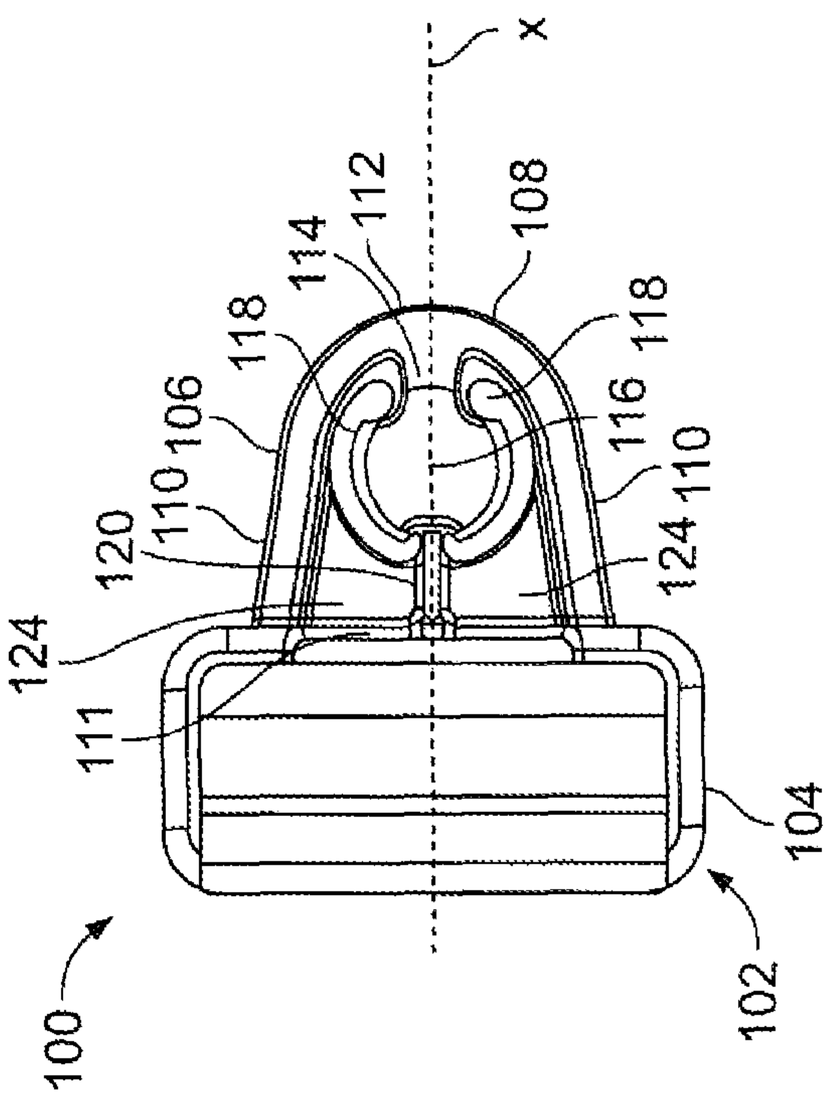

FIG. 9

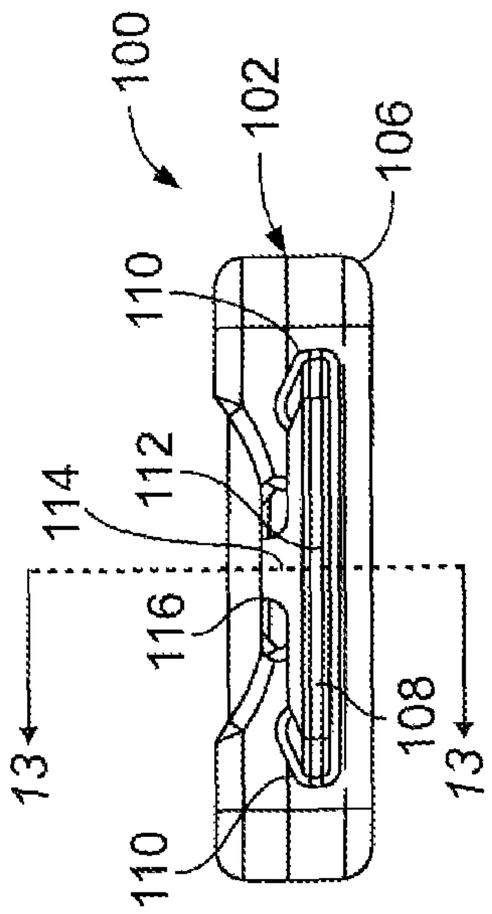

FIG. 12

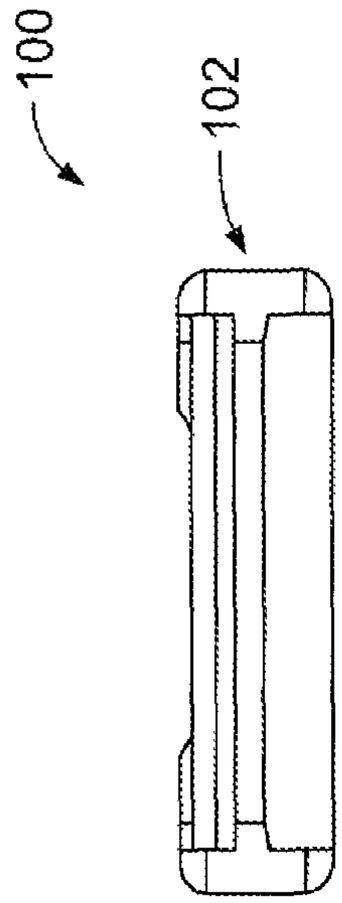

FIG. 14

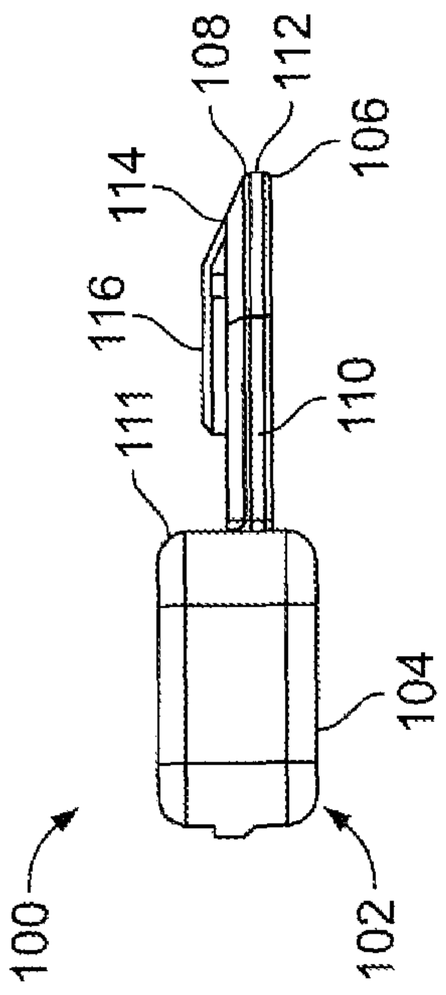

FIG. 11

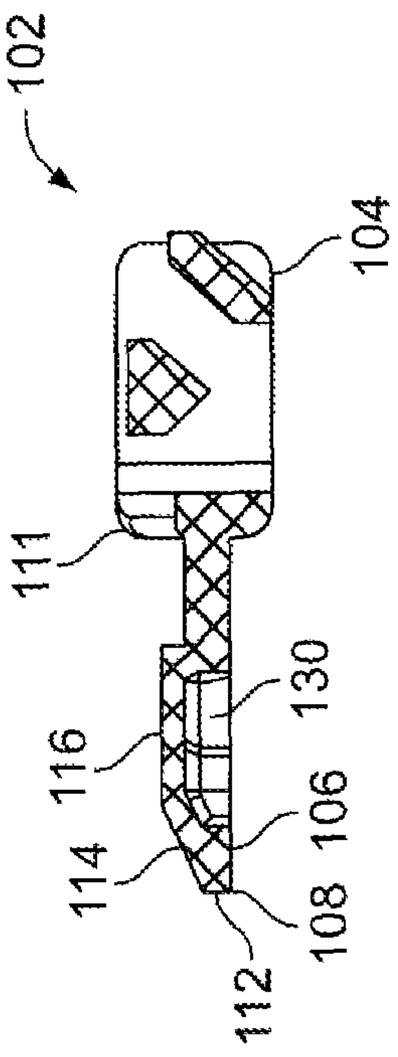

FIG. 13

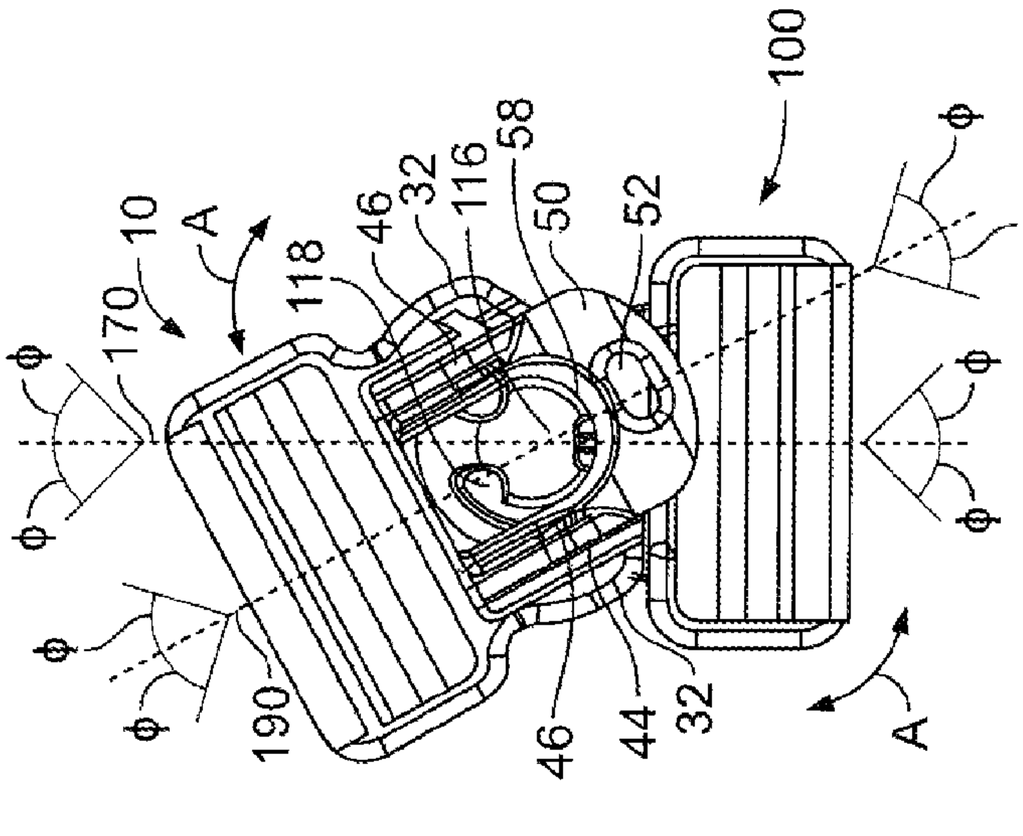

FIG. 16

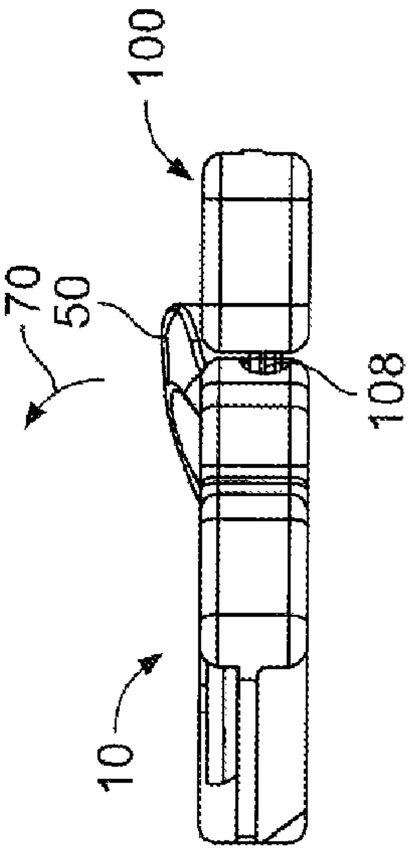

FIG. 18

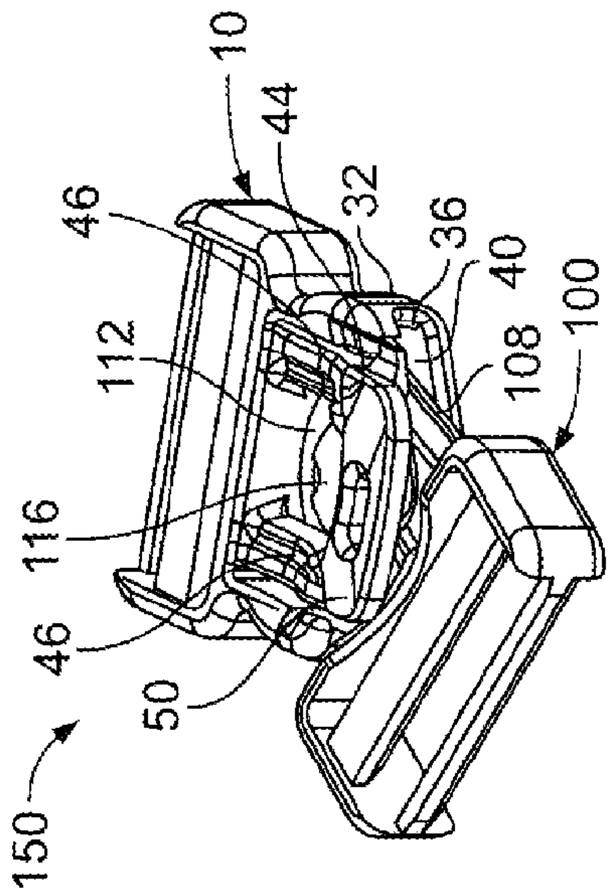

FIG. 15

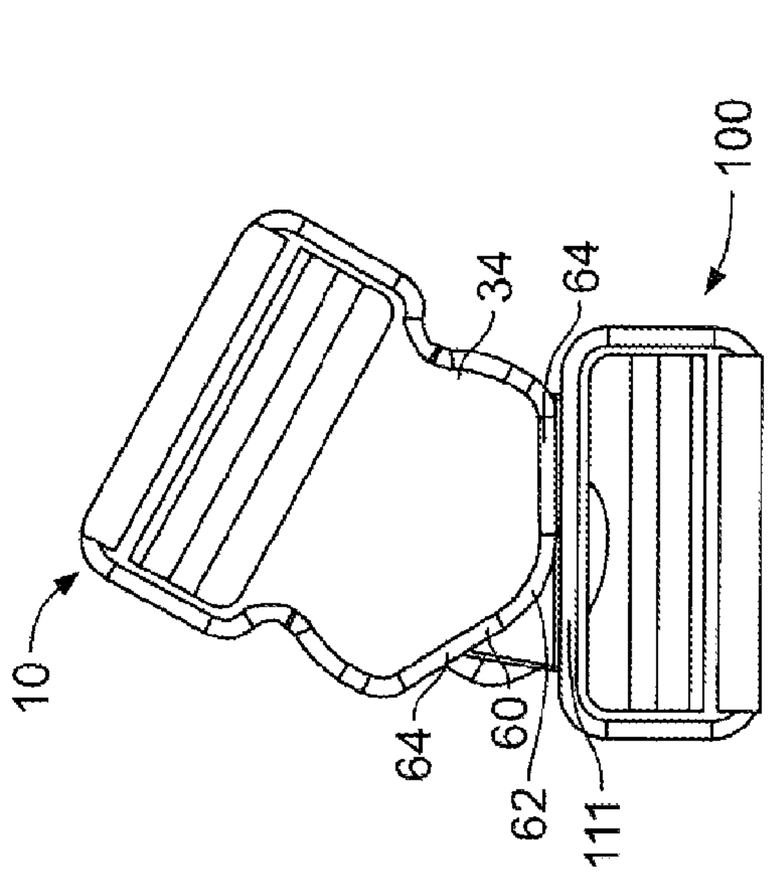

FIG. 17

ROTATABLE BUCKLE ASSEMBLY

RELATED APPLICATIONS

The present application is a National Phase of PCT/US2013/036729 filed Apr. 16, 2013 and relates to and claims priority benefits from U.S. Provisional Patent Application No. 61/625,751 filed Apr. 18, 2012, which is hereby incorporated by reference in its entirety.

FIELD OF EMBODIMENTS OF THE DISCLOSURE

Embodiments of the present disclosure generally relate to a buckle assembly, and, more particularly, to a buckle assembly having first and second buckle members that may rotate or pivot with respect to one another in a connected state.

BACKGROUND

Buckles are used to securely connect components together. For example, various bags, backpacks, and the like have male and female buckle members connected to straps, webbing, or the like. Each strap, for example, is looped through a web channel on a buckle member. In order to connect the straps together, the male buckle member is connected to the female buckle member.

In certain applications, it is desirable to allow the buckle members to pivot or rotate with respect to one another while connected. Pivoting or rotating buckle assemblies may be used to provide comfort and easier adjustment. For example, a backpacker may shift or rotate a buckle assembly of the backpack in order to provide a more comfortable fit.

A known rotating buckle assembly includes a female buckle member having a slot into which a male buckle member is inserted. The male buckle member includes a central circular button that flexes through a circular recess formed in the female buckle member. The buckle members are configured to allow the buckle members to pivot or rotate about an axis of the circular button. In order to disconnect the male buckle member from the female buckle member, the circular button is pushed in a direction that is parallel to the pivot axis.

However, the circular button is generally exposed, and may be inadvertently engaged by the buckle assembly abutting into other objects. Moreover, the circular button may be over-flexed, thereby causing material fatigue, and causing the circular button to malfunction. Further, the circular button is susceptible to being broken away from the male buckle member.

SUMMARY OF EMBODIMENTS OF THE DISCLOSURE

Certain embodiments of the present disclosure provide a rotatable buckle assembly that may include a first buckle member, such as a male buckle member, and a second buckle member, such as female buckle member. The first buckle member may include an insertion member. The second buckle member is configured to rotatably connect to the first buckle member. The second buckle member may include a handle and an insertion channel configured to receive the insertion member. The insertion member is rotatably retained within the insertion channel when the first buckle member is rotatably connected to the second buckle member. The handle is configured to be pulled to disconnect the first buckle member from the second buckle member.

The insertion member may include an internal stud that conforms to a contour of a portion of the second buckle member. The internal stud may be configured to be rotatably retained by the portion of the second buckle member. The second buckle member may include opposed pivot beams connected to the handle. The handle may also include an arcuate internal edge that rotatably engages the internal stud. The opposed pivot beams may be positioned over a plane, such as a plane that contains an exposed upper surface, of the internal stud.

The handle may also include a lanyard opening configured to retain a lanyard that is configured to be grasped and pulled. The handle may also include an upturned end that is configured to be grasped and pulled.

The second buckle member may include a base having an outer receiving edge with recessed lateral portions that are configured to limit rotatable movement of the first buckle member with respect to the second buckle member. The insertion member may include arcuate openings. The handle may further include securing protrusions configured to be slidably retained within the arcuate openings when the first buckle member is rotatably connected to the second buckle member. The first buckle member may be configured to pivot through an arc of +/−30° with respect to a central axis of the second buckle member, or vice versa.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** illustrates an isometric top view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **2** illustrates a top view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **3** illustrates a bottom view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **4** illustrates a lateral view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **5** illustrates a male-receiving end view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **6** illustrates a web-retaining end view of a female buckle member, according to an embodiment of the present disclosure.

FIG. **7** illustrates a cross-sectional view of a female buckle member through line **7-7** of FIG. **6**, according to an embodiment of the present disclosure.

FIG. **8** illustrates an isometric top view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **9** illustrates a top view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **10** illustrates a bottom view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **11** illustrates a lateral view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **12** illustrates a female-insertion end view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **13** illustrates a cross-sectional view of a male buckle member through line **13-13** of FIG. **12**, according to an embodiment of the present disclosure.

FIG. **14** illustrates a web-retaining end view of a male buckle member, according to an embodiment of the present disclosure.

FIG. **15** illustrates an isometric top view of a connected buckle assembly, according to an embodiment of the present disclosure.

FIG. **16** illustrates a top view of a connected buckle assembly, according to an embodiment of the present disclosure.

FIG. **17** illustrates a bottom view of a connected buckle assembly, according to an embodiment of the present disclosure.

FIG. **18** illustrates a lateral view of a connected buckle assembly, according to an embodiment of the present disclosure.

Before the embodiments of the disclosure are explained in detail, it is to be understood that the disclosure is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The disclosure is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of "including" and "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE DISCLOSURE

FIG. **1** illustrates an isometric top view of a female or first buckle member **10**, according to an embodiment of the present disclosure. The female buckle member **10** may be formed of plastic, metal, and/or the like. For example, the female buckle member **10** may be integrally molded and formed as a single piece of injection-molded plastic. The female buckle member **10** may include a main housing **12** having a web-retaining portion **14** and a male-receiving portion **16**.

The web-retaining portion **14** includes opposed lateral walls **18** connected to a strut **20** that may be generally perpendicular to the lateral walls **18**. A web-receiving crossbeam **22** and a web-securing crossbeam **24** span between the opposed lateral walls **18**. A web passage **26** is defined between the web-receiving crossbeam **22**, the web-securing crossbeam **24**, and the strut **20**. The web passage **26** includes an receiving opening **28** and a securing opening **30**. The web passage **26** is configured to receive and adjustably retain a web member, such as a strap, webbing, rope, string, and/or the like.

The male-receiving portion **16** includes opposed lateral walls **32** integrally connected to a planar base **34** that spans between the lateral walls **32**. The lateral walls **32** and the base **34** may integrally connect to the strut **20**. Notches **36** may be formed proximate to front ends **38** of the lateral walls **32**. The notches **36** are configured to receive lateral arms of a male insertion member. As such, an insertion channel **40** is defined between an upper surface **42** of the base **34** and the notches **36**. Alternatively, the notches **36** may not be formed in the lateral walls **32**, in which case the insertion channel **40** is defined between the upper surface **42** of the base **34** and interior surfaces of the lateral walls **32**.

A securing latch **44** extends over the insertion channel **40**. Over-pull tabs **45** may be positioned under portions of the securing latch **44**, and prevent the securing latch **44** from being over-extended and/or breaking. The securing latch **44** includes opposed flexible pivot beams **46** that outwardly extend from the strut **20** over the insertion channel **40** proximate to the lateral walls **32**. A central space **48** separates the pivot beams **46**. The pivot beams **46** may generally be perpendicular to the strut **20** and extend in an opposite direction from the web-retaining portion **14**. Distal ends of the pivot beams **46** connect to a handle **50**, which connects both pivot beams **46** together. The handle **50** may be cross-wise to the pivot beams **46**. A lanyard opening **52** may be formed through a portion of the upturned handle **50**. The lanyard opening **52** is configured to securely retain a lanyard, rope, string, or the like, which may be used to pull the securing latch **44**.

FIG. **2** illustrates a top view of the female buckle member **10**. The central space **48** may be defined by a straight interior edge **54** of the strut **20**, straight interior edges **56** of the pivot beams **46**, and an arcuate interior edge **58** of the handle **50**. The arcuate interior edge **58** may be a semi-circular edge. For example, the arcuate interior edge **58** may span a radial angle θ, which may be 180°. Alternatively, the radial angle θ may be greater or less than 180°.

FIG. **3** illustrates a bottom view of the female buckle member **10**. The base **34** may include an outer receiving edge **60** having a central apex or tip **62** and recessed lateral portions **64**, such as wings, that span between the apex **62** and the lateral walls **32**. The recessed lateral portions **64** may recede away from the apex at an angle β, which may be between 20°-45°. Alternatively, however, the angle β, may be less than 20° or greater than 45°. The recessed lateral portions **64** provide barriers past which a male connection member is prevented from rotating. As such, the recessed lateral portions **64** may dictate the pivotal range of the female buckle member **10** in relation to a male buckle member.

FIG. **4** illustrates a lateral view of the female buckle member **10**. As noted above, the insertion channel **40** may be defined between an upper surface **42** of the base **34** and the notches **36** formed in the lateral walls **32**. A lower surface **66** of the handle **50** may be positioned over an open end of the insertion channel **40**.

The handle **50** may include a graspable upturned end **68**, which may be upwardly canted at an angle θ with respect to the lower surface **66**. The angle θ may be between 10°-25°, for example. Alternatively, however, the angle θ may be less than 10° or greater than 25°. Additionally, the handle **50** may not include the upturned end **68**. Instead, the entirety of the handle **50** may be a longitudinal beam that is parallel with the base **34**. In operation, the handle **50** is configured to be grasped by a user and pulled upward in the direction of arc **70**. Optionally, the user may grasp a lanyard looped through the lanyard opening **52** and pull in the direction of arc **70**. When the handle **50** is pulled in the direction of arc **70**, the flexible beams **46** (shown in FIGS. **1** and **2**) upwardly pivot about areas proximate to the strut **20** (shown in FIGS. **1** and **2**). When the user disengages the handle **50**, the flexible beams **46** flex back down to their at-rest positions, and the handle **50** returns to the position shown in FIG. **4**.

FIG. **5** illustrates a male-receiving end view of the female buckle member **10**. One or more securing protrusions **72** may extend from the handle **50** or the pivot beams **46**. The securing protrusions **72** may be barbs, clasps, latches, or the like that are configured to be retained within reciprocal structures of a male buckle member, such as arcuate channels formed around portions of an interior stud. Thus, in the connected position, the securing protrusions **72** may be slidably retained within channels, for example, formed

through a portion of a male buckle member. In order to remove the securing protrusions **72** from the channels, the handle **50** is pulled upward in the direction of arc **70**, thereby disengaging the securing protrusions from reciprocal channels.

FIG. **6** illustrates a web-retaining end view of the female buckle member **10**. FIG. **7** illustrates a cross-sectional view of the female buckle member **10** through line **7-7** of FIG. **6**. Referring to FIGS. **6** and **7**, as noted above, the web-retaining portion **14** includes the web passage **26**, into which a web member, such as webbing, a strap, rope, string, or the like, is adjustably retained.

FIG. **8** illustrates an isometric top view of a male or second buckle member **100**, according to an embodiment of the present disclosure. It is to be understood that the male buckle member **100** may be considered the first buckle member, while the female buckle member **10** may be considered the second buckle member, or vice versa. FIG. **9** illustrates a top view of a male buckle member **100**, while FIG. **10** illustrates a bottom view of a male buckle member **100**. Referring to FIGS. **8-10**, the male buckle member **100** may be formed of plastic, metal, and/or the like. For example, the male buckle member **100** may be integrally molded and formed as a single piece of injection-molded plastic. The male buckle member **100** may include a main housing **102** having a web-retaining portion **104** and a female-insertion portion **106**. The web-retaining portion **14** may be similar to the web-retaining portion **14** of the female buckle member **10** described above.

The female-insertion portion **106** includes an insertion member **108**, such as a tongue, prong, beam, tab, or the like. The insertion member **108** may include lateral arms **110** that extend from central a strut **111** in a direction opposite from the web-retaining portion **104**. The lateral arms **110** are integrally connected to an arcuate outer tip **112** that may generally conform to the shape of the arcuate interior edge **58** of the handle **50** (shown in FIG. **2**). As shown in FIGS. **9** and **10**, in particular, the lateral arms **110** may inwardly cant toward a central axis x. Alternatively, the lateral arms **110** may be perpendicular to the strut **111**. The lateral arms **110** and the arcuate outer tip **112** may be rounded and smooth. For example, the lateral arms **110** and the outer tip **112** may be cylindrical in axial cross-section.

A central interior beam **114** extends from the outer tip **112** toward the web-retaining portion **104** and connects to an interior stud **116**. A height of the interior stud **116** may be greater than that of each of the lateral arms **110**. Arcuate openings **118** may be formed on either side of the interior stud **116**. The arcuate openings **118** may be configured to slidably retain the securing protrusions **72** (shown in FIG. **5**) of the female buckle member **10** when the male buckle member **100** is securely mated with the male buckle member **100**.

A connecting fin **120** may connect an interior end **122** of the interior stud **116** to the strut **111**. Additionally, planar support walls **124** may be formed between each lateral arm **110**, the strut **111**, the connecting fin **120**, and edges that define the arcuate opening **118**. Alternatively, the male buckle member **100** may not include the connecting fin **120** and/or the support walls **124**. For example, the interior stud **116** may simply extend from the interior beam **114**, with openings between the outer edges of the interior stud **116** and lateral arms **110** and the strut **111**. Additionally, alternatively, the male buckle member **100** may not include the arcuate openings **118**. Instead, the area between the strut **111**, the arms **110**, and the outer tip **112** may include contiguous material, such as support walls connecting directly to the interior stud **116**. Also, alternatively, the interior stud **116** may be sized and shaped differently than shown.

FIG. **11** illustrates a lateral view of the male buckle member **100**. As shown, the interior stud **116** may extend to a height that exceeds that of the lateral arms **110**. Further, the central interior beam **114** may be beveled, thereby providing a lead-in nose that is configured to automatically align and lead the insertion member **108** into the insertion channel **40** (shown in FIGS. **1**, **4**, **5**, and **7**) of the female buckle member **10**.

FIG. **12** illustrates a female-insertion end view of the male buckle member **100**. FIG. **13** illustrates a cross-sectional view of the male buckle member **100** through line **13-13** of FIG. **12**. Referring to FIGS. **12** and **13**, the interior stud **116** may include a cored-out underside **130**, which reduces material cost and provides a lighter male buckle member **100**. In order to connect the male buckle member **100** to the female buckle member **10** (shown in FIGS. **1-7**), the male buckle member **100** is urged toward the insertion channel **40** of the female buckle member **10**, and the insertion member **108** is mated into the insertion channel **40**.

FIG. **14** illustrates a web-retaining end view of the male buckle member **100**. The web-retaining portion **102** is configured to adjustably retain a web member, as described above with respect to the female buckle member **10**.

FIG. **15** illustrates an isometric top view of a connected buckle assembly **150**, according to an embodiment of the present disclosure. In order to connect the male buckle member **100** with the female buckle member **10**, the insertion member **108** is aligned with the insertion channel **40**. The outer tip **112** is then urged into the insertion channel **40**, with the beveled interior beam **114** providing a lead-in feature that automatically vertically aligns the male buckle member **100** with respect to the female buckle member **10**. As the insertion member **108** is urged into the female buckle member **10**, the interior stud **116** passes under the handle **50** and deflects the handle **50** upwardly. The opposed lateral beams **46** of the securing latch **44** flex and pivot upward, allowing the handle **50** to move in response. Once the interior stud **116** is moved past the handle **50**, the handle **50** deflects back down to its at-rest position. During this movement, the securing protrusions **72** (shown in FIG. **5**) of the female buckle member **10** snap or otherwise deflect into the arcuate openings **118** (shown in FIGS. **8** and **9**, for example). In this manner, the male buckle member **100** may snappably connect to the female buckle member **10**. The securing protrusions are slidably retained within the arcuate openings **118**, thereby adjustably securing the female buckle member **10** to the male buckle member **100**.

FIG. **16** illustrates a top view of the connected buckle assembly **150**. Referring to FIGS. **15** and **16**, in the connected position, the interior stud **116** is slidably retained against the arcuate interior edge **58** of the handle **50**. The contours of the interior stud **116** may generally conform to the contours of the arcuate interior edge **58**.

As shown in FIG. **15**, in particular, the opposed pivot beams **46** and the handle **50** are generally positioned over a plane of an upper surface of the interior stud **116**. As such, the pivot beams **46** and the handle **50** generally protect against the interior stud **116** from being accidentally engaged, touched, or the like. Moreover, in order to disconnect the male buckle member **100** from the female buckle member **10**, the handle **50** is pulled in order to disengage the securing protrusions **72** from the arcuate openings **118**. Accordingly, instead of a central button being depressed (a

movement that may be susceptible to unintentional engagement), the handle **50** is pulled in order to disconnect the assembly **150**.

As shown in FIG. **16**, in particular, the male buckle member **100** may be pivoted with respect to the female buckle member **10** in the directions of arcs A. The range of pivotal motion may be defined by the length of the arcuate openings **118**. That is, the terminal ends of the arcuate openings **118** define barriers past which the securing protrusions **72** may not pass. Further, the notches **36** (shown in FIG. **15**, for example) formed in the lateral walls **32** provide expanded areas into which the lateral arms **110** of the insertion member **108** may move. As such, the notches **36** may allow for increased pivotal motion. The arcuate openings **118** may have lengths that are greater or less than shown, in order to tailor a desired range of motion. When the male buckle member **100** is connected to the female buckle member **10**, the buckle assembly **150** allows the buckle members **100** and **10** to swivel, pivot, rotate, or the like with respect to one another over a wide sweep, such as +/−30°. However, the assembly **150** may be configured to allow for sweep angles that are greater or less than +/−30°. As shown in FIG. **16**, the female buckle member **10** is configured to pivot relative to the male buckle member **100** through an arc of +/−Φ with respect to a central axis **170** of the male buckle member **100**, or vice versa. Similarly, the male buckle member **100** is configured to pivot relative to the female buckle member **10** through an arc of +/−Φ with respect to a central axis **190** of the male buckle member **100**, or vice versa. In other words, the male buckle member **100** and the female buckle member **10** are configured to pivot relative to one another through an arc of +/−Φ. The angle Φ may be 30°, for example. However, the angle Φ may be greater or less than 30°, depending on a desired sweep angle, which may be dictated by the size and length of the arcuate openings **118**, and the angle of the recessed lateral portions **64**, for example.

FIG. **17** illustrates a bottom view of the connected buckle assembly **150**. As noted above, the recessed lateral portions **64** of the outer receiving edge **60** of the base **34** of the female buckle member **10** may also define the range of pivotal motion. For example, pivotal motion in each direction is stopped when the recessed lateral portions **64** abut into the strut **111** of the male buckle member **100**. The sizes and shapes of the recessed lateral portions **64** and the arcuate openings **118** (shown in FIGS. **8** and **9**, for example) may be coordinated with one another, such that when a securing protrusion **72** abuts into a terminal end of an arcuate opening **118**, a recessed lateral portion **64** abuts into the strut **111**.

FIG. **18** illustrates a lateral view of the connected buckle assembly **150**. In order to disconnect the assembly **150**, the handle **50** is pulled in the direction of arc **70**. As the handle **50** is pulled, the securing protrusions **72** (shown in FIG. **5**) disengage from the arcuate openings **118** (shown in FIGS. **8** and **9**, for example), and the interior stud **116** disengages from the arcuate interior edge **58** of the handle **50**. When the securing protrusions **72** are no longer slidably retained with the arcuate openings **118**, the insertion member **108** of the male buckle member **100** may be pulled out of the insertion channel **40** of the female buckle member **10**, thereby disconnecting the assembly **150**.

Instead of pushing down on the interior stud **116**, the handle **50** of the female buckle member **10** is pulled upward to disconnect the assembly **150**. As noted, the handle **50** may include an opening configured to receive a rope, string, lanyard, or the like, which a user may engage. Optionally, the user may simply grasp the handle **50** between two fingers. In this manner, the handle **50** is configured to be grasped and pulled by an individual.

Therefore, inadvertent bumps into the buckle assembly **150** will not result in an inadvertent disconnection.

Embodiments of the present disclosure provide a rotatable buckle assembly configured to be disconnected through a user pulling up on a portion of a buckle member. For example, the user may directly grasp the handle **50** of the female buckle member **10**, or pull up on a lanyard, string, or the like, operatively connected to the handle **50**.

Embodiments of the present disclosure also provide a rotatable buckle assembly having a male buckle member **100** that is configured to rotate within a housing of the female buckle member **10**. Rotation stops, such as the recessed lateral portions **64**, on one or more of the buckle members are configured to prevent over-pivoting or flexing. Additionally, the male buckle member may include a solid tongue that is less susceptible to breaking, as compared to known buckle assemblies.

While various spatial and directional terms, such as top, bottom, lower, mid, lateral, horizontal, vertical, front and the like may be used to describe embodiments of the present disclosure, it is understood that such terms are merely used with respect to the orientations shown in the drawings. The orientations may be inverted, rotated, or otherwise changed, such that an upper portion is a lower portion, and vice versa, horizontal becomes vertical, and the like.

Variations and modifications of the foregoing are within the scope of the present disclosure. It is understood that the embodiments disclosed and defined herein extend to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present disclosure. The embodiments described herein explain the best modes known for practicing the disclosure and will enable others skilled in the art to utilize the disclosure. The claims are to be construed to include alternative embodiments to the extent permitted by the prior art.

Various features of the disclosure are set forth in the following claims.

The invention claimed is:

1. A rotatable buckle assembly comprising: a first buckle member including an insertion member; and

a second buckle member configured to rotatably connect to the first buckle member, wherein the second buckle member includes a base, a handle connected to the base through opposed pivot beams and an insertion channel configured to receive the insertion member, wherein the insertion member is rotatably retained within the insertion channel when the first buckle member is rotatably connected to the second buckle member, and the handle being configured to be upwardly pulled relative to the base to disconnect the first buckle member from the second buckle member.

2. The rotatable buckle assembly of claim **1**, wherein the insertion member comprises an internal stud that conforms to a contour of a portion of the second buckle member, and wherein the internal stud is configured to be rotatably retained by the portion of the second buckle member.

3. The rotatable buckle assembly of claim **2**, wherein the second buckle member comprises opposed pivot beams connected to the handle, wherein the handle comprises an arcuate internal edge that rotatably engages the internal stud when the first buckle member is rotatably connected to the second buckle member.

4. The rotatable buckle assembly of claim 3, wherein the opposed pivot beams and the handle are positioned over a plane in which an exposed surface of the internal stud resides.

5. The rotatable buckle assembly of claim 1, wherein the handle comprises a lanyard opening configured to retain a lanyard that is configured to be grasped and pulled.

6. The rotatable buckle assembly of claim 1, wherein the handle comprises an upturned end that is configured to be grasped and pulled.

7. The rotatable buckle assembly of claim 1, wherein the second buckle member comprises a base including an outer receiving edge having recessed lateral portions that are configured to limit rotatable movement of the first buckle member with respect to the second buckle member.

8. The rotatable buckle assembly of claim 1, wherein the insertion member comprises arcuate openings, and wherein the handle comprises securing protrusions configured to be slidably retained within the arcuate openings when the first buckle member is rotatably connected to the second buckle member.

9. The rotatable buckle assembly of claim 1, wherein the first buckle member is configured to pivot through an arc of +/−30° with respect to a central axis of the second buckle member, or vice versa.

10. A rotatable buckle assembly comprising: a male buckle member; and

a female buckle member configured to rotatably connect to the male buckle member, wherein the female buckle member comprises a base and a handle connected to the base through opposed pivot beams that is configured to be upwardly pulled relative to the base to disconnect the male buckle member from the female buckle member.

11. The rotatable buckle assembly of claim 10, wherein the male buckle member comprises an insertion member, wherein the female buckle member further comprises an insertion channel configured to receive the insertion member, and wherein the insertion member is rotatably retained within the insertion channel when the male buckle member is rotatably connected to the female buckle member.

12. The rotatable buckle assembly of claim 11, wherein the insertion member comprises an internal stud, wherein the female buckle member further comprises opposed pivot beams connected to the handle, and wherein the handle comprises an arcuate internal edge that rotatably engages the internal stud when the male buckle member is rotatably connected to the female buckle member.

13. The rotatable buckle assembly of claim 12, wherein the opposed pivot beams and the handle are positioned over a plane in which an exposed surface of the internal stud resides.

14. The rotatable buckle assembly of claim 10, wherein the handle comprises a lanyard opening configured to retain a lanyard that is configured to be grasped and pulled.

15. The rotatable buckle assembly of claim 10, wherein the handle comprises an upturned end that is configured to be grasped.

16. The rotatable buckle assembly of claim 10, wherein the female buckle member comprises a base including an outer receiving edge having recessed lateral portions that are configured to limit rotatable movement of the male buckle member with respect to the female buckle member.

17. The rotatable buckle assembly of claim 10, wherein the insertion member comprises arcuate openings, and wherein the handle comprises securing protrusions configured to be slidably retained within the arcuate openings when the male buckle member is rotatably connected to the female buckle member.

18. The rotatable buckle assembly of claim 10, wherein the male buckle member is configured to pivot through an arc of +1-30° with respect to a central axis of the female buckle member, or vice versa.

19. A rotatable buckle assembly comprising:

a male buckle member including an insertion member having an internal stud and arcuate openings around portions of the internal stud; and

a female buckle member configured to rotatably connect to the male buckle member, wherein the female buckle member comprises:

a base including an outer receiving edge having recessed lateral portions that are configured to limit rotatable movement of the male buckle member with respect to the female buckle member;

an insertion channel configured to receive the insertion member, wherein the insertion member is rotatably retained within the insertion channel when the male buckle member is rotatably connected to the female buckle member;

a handle that is pulled to disconnect the first buckle member from the second buckle member, wherein the handle comprises (a) an arcuate internal edge that rotatably engages the internal stud when the male buckle member is rotatably connected to the female buckle member, (b) an upturned end that is configured to be grasped and upwardly pulled relative to the base to release the first buckle member from the second buckle member, (c) a lanyard opening configured to retain a lanyard that is configured to be grasped and pulled, and (d) securing protrusions configured to be slidably retained within the arcuate openings when the male buckle member is rotatably connected to the female buckle member; and

opposed pivot beams connecting the handle to the base, wherein the opposed pivot beams and the handle are positioned over a plane in which an exposed surface of the internal stud resides.

20. The rotatable buckle assembly of claim 19, wherein the male buckle member is configured to pivot through an arc of +1-30° with respect to a central axis of the female buckle member, or vice versa.

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